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IDENTIFICATION AND SIGNIFICANCE OF THE CUCURBIT MATERIALS FROM HUACA PRIETA, PERU

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CONTENTS

THE ARCHAEOLOGICAL BACKGROUND, BY JUNIUS B. BIRD.....	1
Utilization of Gourds.....	3
Containers.....	3
Fish-net Floats.....	5
Discs.....	5
Scoops or Ladles.....	5
Decorative Techniques.....	5
Repair of Broken Gourds.....	6
Material Associated With Early Ceramics.....	6
Summary.....	7
BOTANICAL IDENTIFICATION AND SIGNIFICANCE, BY THOMAS W. WHITAKER.....	8
Methods.....	8
Materials.....	9
Discussion and Conclusions.....	12
LITERATURE CITED.....	15

THE ARCHAEOLOGICAL BACKGROUND²

The cucurbit materials described by Dr. Whitaker were recovered at a site known locally as the Huaca Prieta on the coast line of the Chicama Valley, Peru, at about latitude 8° S. Despite severe erosion, the huaca, a large compact midden, still has a

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² This field work was a part of the Andean Institute-Virú Valley survey, a cooperative undertaking shared by the American Museum of Natural History, the Chicago Natural History Museum, the Smithsonian Institution, and Columbia and Yale Universities, 1946-1947.

maximum thickness of 45 feet. To determine its nature and contents, blocks or columns of debris were isolated and then separated into successive layers by following the visibly traceable strata. In one pit (HP-3) 22 such layers, some subdivided into several parts, spanned the full period of occupation of the site. As study of the collection proceeds, it appears from the distribution of certain items that the material of these layers can be grouped into six or seven chronological units.

A second pit (HP-2) provided additional material roughly contemporaneous with the lower six levels or first two units of the larger section. In both excavations the dirt was screened, and all plant remains and artifacts were saved. Because of ideal conditions for preservation, the quantity of perishable material exceeded all expectations. As an example, the squash and gourd remains from these two pits amounted to over 11,000¹ shell fragments, 1300 seeds, and about 550 peduncle fragments. Of this pre-ceramic material only that from Layer M in HP-3 was sent to Dr. Whitaker for study. This did not include 1500 shell fragments from this layer discarded after the field record was made. The series for study was selected for various reasons: its position well down in the mound near the lower limits of best preservation, the high yield of this particular layer, and a hope that it would prove to be an adequate sample, since it apparently contained examples of everything found in the other layers.

As preliminary reports (Bennett, 1948; Bird, 1948) on this excavation have appeared and as a monograph is in preparation, my comments are limited to details that explain the setting and supplement Dr. Whitaker's study.

From the excavations it was clear that the concentration of debris was the result of continuous occupation of a limited area by a people whose economy was based partially on agriculture, partially on fishing. Their material culture was in some respects quite primitive. In view of the subsequent ceramic record in Peru, it is of general interest that they had no knowledge of pottery. This and other evidence indicate considerable antiquity for the remains, prompting a guess that we are dealing with a culture period which may fall between 3000 and 1000 B.C.

The plants utilized during this period, except for the Cucur-

¹ In order to compensate for the breakage resulting from excavation and handling, the small shell fragments showing fresh fractures were grouped by three's and counted as the equivalent of one unbroken piece.

bitaceae, have been tentatively identified. Beans of at least three varieties (all *Canavalia*?), chili peppers, cotton, and canna were probably cultivated. Evidence for the latter consists principally of many scraps of the rhizome skin and some leaves. Definitely wild, but commonly utilized as food, were the small tubers from *Scirpus (americanus?)* and *Cyperus* sp.? Roots of cat-tail seem also to have been eaten. Important fruits were the *Lucuma* and *Bunchosia* sp.? Two other plants, as yet unidentified, were of considerable economic importance: one provided bark for barkcloth, and the second, possibly *Agave*, yielded a bast fiber used to some extent in combination with cotton in the production of many fabrics. In this period there was no evidence for the presence of maize.

UTILIZATION OF GOURDS

Among the 10,770 gourd shell pieces for which we have relative position data in HP-3, only 358 (3.3 per cent) give some clue as to their use. An additional hundred bear some slight indication of having been cut or worked in some manner. This percentage is so low that it might well be misleading to limit the discussion to the gourd shells found with the Layer M material. Thus the following is based on an analysis of the 358 specimens which are classifiable into four categories: containers, 72.4 per cent; fish-net floats and float stoppers, 15.1 per cent; discs of unknown use, 5 per cent; and fragments of scoops or ladles, 7.5 per cent.

CONTAINERS: Among these, open-mouthed bowls predominate, all made by sectioning the gourd transversely. This, unlike a longitudinal cut, yields only one container per gourd. Usually the incision was made high enough so the bowl rims were incurving; very few were cut where the fruit reaches its maximum diameter. One rim fragment of this latter type, found in the top level of the pre-ceramic debris, has an indicated diameter of 40 to 42 cm. Another, found midway between this and the M layer, apparently measured 34 cm. in diameter. These sizes are exceptional; as a rule the bowls were under 22 cm. in diameter, with a possible depth of 10 or 12 cm.

The short-necked type of *Lagenaria siceraria*, with the neck cut off, produced a constricted-mouth jar form. These vary considerably in size and rim profile. Cuts made farther up on the neck of the long-necked *L. siceraria* yielded a bottle form, but it is impossible to distinguish with certainty whether the fragments

are from these bottle forms or from fish-net floats. The same type of gourd served as small spherical containers about 6 cm. in diameter. Remains of two of these had been fitted with flattened circular covers cut from a much larger specimen.

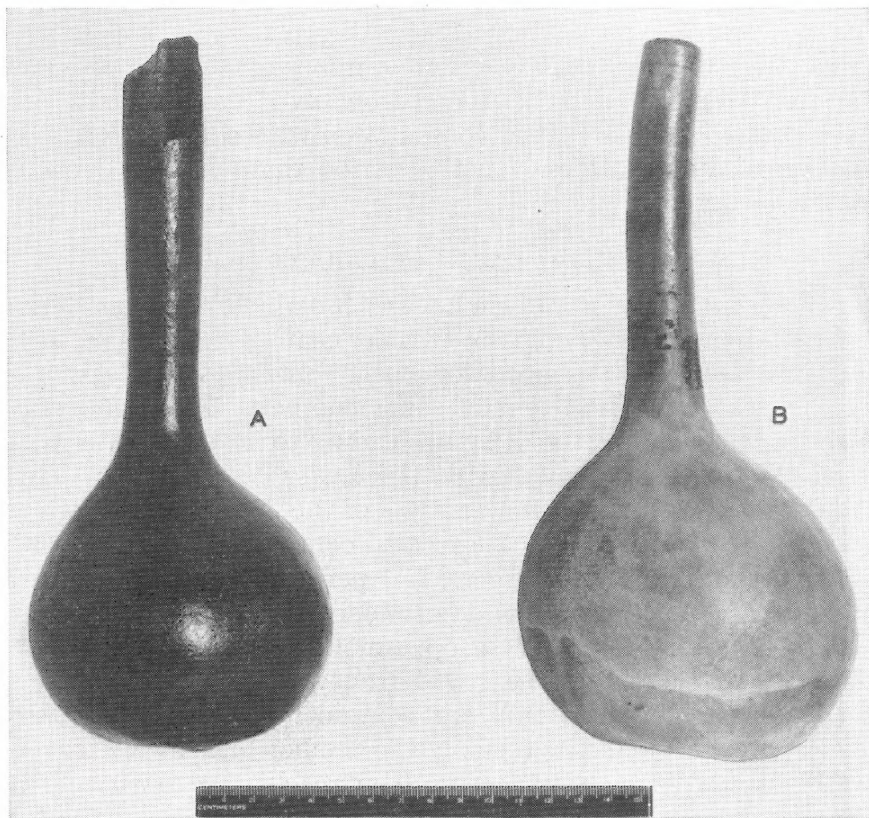


FIG. 1. Fruits of *Lagenaria siceraria* from Huaca Prieta. A. Virtually intact fruit, Test 5; probably used for fish-net float. B. Fruit of *L. siceraria*, Test 3; used for fish-net float.

The only other objects here classed as containers are a few fragments, also of the long-necked *Lagenaria siceraria*, which have had part of one side removed to form a dipper. The relative frequencies of these and the other types of containers are as follows:

	PER CENT
Bowls, incurving rims	80.4
Bowls, flaring or vertical rims	6.9
Jar form, constricted mouth	5.4
Bottle form	4.3
Small spherical containers	1.1
Dippers	1.9

FISH-NET FLOATS: The fortunate discovery of a large fish net with eight floats attached and still intact positively identifies these objects. All have the tip of the neck cut off and the seeds removed, though a few still remained in the one sent to Dr. Whitaker (figs. 1B, 3C). The openings are plugged with gourd shell discs from 10 to 22 mm. in diameter. Such small discs occur from top to bottom of the mound, sometimes still in place in a float neck fragment. Gourd floats are still used along this coast, but none of the long-necked forms were observed nor are the seeds removed as in the past.

DISCS: Discs larger than those used in the floats occur in the upper third of the midden. Plain, smooth-edged discs vary in diameter from 3 to 7 cm. Rough-edged discs with one, two, or three perforations near the margin are slightly larger. Another well-finished example has 12 small punctures at the margin and four holes at the center in which cords remain.

SCOOPS OR LADLES: Various fragments of roughly oval and angular objects with worn or smoothed edges can perhaps be classed as ladles. The absence of complete specimens and the lack of uniformity among the fragments make a clear description difficult. Apparently any broken gourd fragment of sufficient size was suitable as a makeshift spoon for stirring or serving food. One occasionally sees such pieces in use today and though they are not cut to a specific pattern they are nonetheless real utensils.

DECORATIVE TECHNIQUES: In the entire lot of shell fragments, all from containers, only 13, or one in 830, were decorated. With such a low rate of occurrence, it is surprising to find several distinct methods of decoration.

Crudest are those with lines and marks made by scratching off the epidermis when it was fresh and soft. In nearly all the incurved rim bowls, the epidermis has been removed just below the lip for a distance varying from 3 to 15 mm., but I hesitate to class this as a decorative feature. Fine line incising in the hard shell was used for diagonal crosshatching in two instances. Five

pieces show pyro-engraving in tantalizingly incomplete fragments of decoration. Two show rather skilful carving of geometric stylized faces. In these, both the design and the quality of work lead us to believe that they are not casual or experimental products, but rather that the method of decoration may have some traditional background. If this is true, then the rarity of decoration is still more of a puzzle.

REPAIR OF BROKEN GOURDS: Broken containers were sometimes repaired by lacing the cracks with cotton cord. Examples are so poorly executed as to suggest that gourds were so abundant that skilful repairing was unnecessary.

MATERIAL ASSOCIATED WITH EARLY CERAMICS

After the work in the main mound was completed, additional excavations in a smaller accumulation immediately to the north exposed more pre-ceramic debris underlying and blending with pottery-bearing refuse. This provided sufficient material, both botanical and cultural, to establish the relation of the pre-ceramic horizon with the known Cupisnique-Chavín culture. The latter has been described on the basis of the more durable artifacts, and little else relating to it has been found. The nearly simultaneous appearance for the first time in this part of Peru of several plants, maize, peanuts, avocados, *inga*, and a "warty" squash, together with new textile techniques and the Cupisnique ceramics, implies the arrival here of migrants from another region. Items marked HP-5 are from this period and were removed from a considerably smaller volume of debris than that examined in HP-3. Although over 16,500 fragments of pottery were taken from it, the yield of squash and gourd remains was small: 1721 shell fragments, of which 137 are from the warty squash, 144 peduncles, and perhaps a hundred seeds.

The analysis of the gourd shell pieces compared with the pre-ceramic material reveals some distinctions. Diagnostic specimens, that is, those of determinable use, constitute 5.8 per cent of the total. The proportion of decorated fragments is much higher, one in every 28, or 3.5 per cent of the total. The only method represented is pyro-engraving, with which a variety of curvilinear designs was created. In addition to the bowl forms already mentioned, there are three fragments from bowls made by cutting the fruit longitudinally. The bottle form containers are represented, but the small spherical type, the dippers, and ladles were

not found in this lot. Unique is a whistle made from a nearly spherical shell, 4 mm. thick, 45 mm. long, and 47 mm. in diameter (fig. 2). The seeds had been removed by cutting out the peduncle

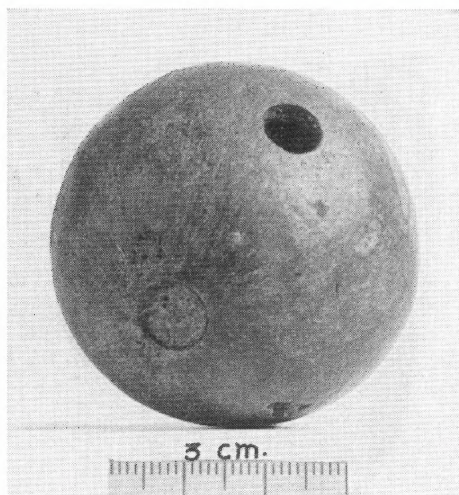


FIG. 2. Spherical fruit of *Lagenaria siceraria* made into whistle. Found with Cupisnique ceramics and early maize (HP-5-A3).

scar and after the insertion of a round clay (?) pellet the hole was closed with a gourd disc. The pellet does not now affect the sound of the whistle made by blowing across a small vent.

SUMMARY

The preceding comments relate primarily to the utilization of the *Lagenaria siceraria* identified by Dr. Whitaker. Whether, in addition, they were ever eaten might be determined by an examination of the coprolites collected. The *Cucurbita*, on the other hand, were obviously an important food. The significance of their presence in this early horizon remains to be evaluated, and the explanation will more likely be supplied by botanists than by archaeologists. Actually we have no clue as to the original home of these people, and unfortunately the nature of their artifacts is such as to promise great difficulty in tracing them. Hence such contributions as Dr. Whitaker's botanical analysis are most welcome.

BOTANICAL IDENTIFICATION AND SIGNIFICANCE

Through the courtesy of Mr. Junius Bird, the writer has been privileged to examine and study the remarkably well-preserved cucurbitaceous materials excavated at Huaca Prieta. The well-organized, systematic excavations directed by Mr. Bird have uncovered some very significant plant material, and a preliminary report (Bird, 1948) has established the fact that the peoples occupying this site were among the earliest agriculturists in the New World. The cucurbit materials are of such importance for ethnobotanists, archaeologists, and others that a separate report of their analysis and identification seems justified.

METHODS

For the most part the cucurbit material submitted for examination was in an excellent state of preservation, considering its age. The shells¹ of both *Lagenaria* and *Cucurbita* were in good condition, and in some instances the fruits of *Lagenaria* were recovered virtually intact (fig. 1). The seeds were not so well preserved as the shells. For some specimens, erosion of the outer seed coat and general deterioration through age made positive identification impossible.

A method for softening and decolorizing the tissue of the walls of the shells and mounting it for microscopic examination has been described previously (Whitaker, 1948). Whenever a particular fragment could not be positively identified as either *Lagenaria* or *Cucurbita* by macroscopic means, it was sectioned and examined microscopically. The histological pattern of the walls of the shell is so different for the two genera that rapid and positive identification is a routine matter.

The seeds of *Lagenaria siceraria* (Molina) Standley are quite distinctive and can easily be identified by inspection. Seeds of *Cucurbita* were checked with the extensive collection maintained

¹ In a previous paper, the author (Whitaker, 1948) used the term "exocarp" to designate the remains of the fruit, i.e., the so-called "shells" or "rind." Dr. R. M. Brooks, Associate Pomologist, University of California, informs me that this term is not applicable to fruit with an inferior ovary, where the carpels are surrounded by accessory tissue. According to Dr. Brooks, the morphological nature of the mature pepo has not been satisfactorily worked out, and for this reason a meaningful term to describe the hard, dry, tough, and brittle remains of the fruit has not been suggested. In the meantime the word "shell" has been applied to these fragments, with the understanding that it has no status in botanical terminology.

at this laboratory. By comparison it was possible to determine rather accurately the precise affiliation of the archaeological seeds.

MATERIALS

A list of the cucurbit materials follows, with notes on their identification and other pertinent comments:

PRE-CERAMIC, PRE-MAIZE GOURDS AND SQUASH; HUACA PRIETA, TEST 3 HP-3-M

81 stems

This collection of peduncles appears to be chiefly those of some species of *Cucurbita*, probably *C. ficifolia*, Bouché. There are a few that may be *Lagenaria siceraria*, but certainly most of them are *Cucurbita*

62 roughly spherical shells with stem scars

Evidently most of this material is some species of *Cucurbita*, probably *C. ficifolia*. Shells range in thickness from 2 mm. to 3 mm. A majority of the fragments have peduncle scars. However, about one-third are from the distal portion of the fruit with the scar and depression from the withered flower parts

11 thin shells, like the preceding

All except 2 of these shells are almost certainly those of some species of *Cucurbita*, probably *C. ficifolia*. The two exceptions have a wall thickness of 3.5 mm. and 4 mm., respectively, and when sectioned proved to be *Lagenaria siceraria*. The remainder have walls averaging about 2 mm. in thickness

12 bottle gourd necks

This collection consists of 12 fragments of the neck portion of the fruits of *Lagenaria siceraria*. The fruits were evidently of the short-necked type; 6 of the fragments retain vestiges of the peduncle. In one case, the portion of the peduncle remaining attached to the neck fragment was approximately 10 mm. in length. The shells are of varying thickness (4 mm. to 8 mm.)

5 centers of base

Fragments from distal portion of the fruit, with depressed area and scar from withered flower parts. Two are an unidentified species of *Cucurbita* (these were sectioned), wall thickness average, 2.5 mm.; the remainder are *Lagenaria siceraria*, wall thickness, 5 to 6 mm.

33 samples of gourd shell showing range in thickness

This collection consists of 33 fragments of shells of *Lagenaria siceraria*. The range in shell thickness for the entire group varies from 4 mm. to 9 mm.; in area from approximately 150 sq. mm. to 2700 sq. mm.

Seeds as listed on field analysis:

12 seeds of *Lagenaria siceraria*

The seeds in this collection show some of the extreme broadness and size characteristic of those in collections of these species from the Old World (fig. 3D)

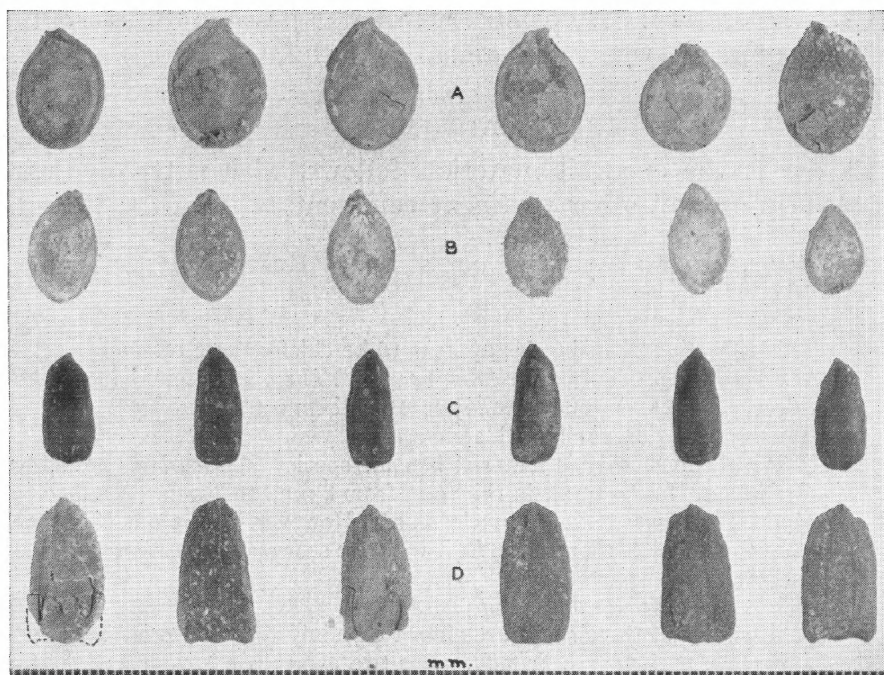


FIG. 3. Seeds of cucurbits from Huaca Prieta, showing range of size and shape of mature seeds. A. *Cucurbita ficifolia*. B. *C. moschata*, fringed-margined variety. C. *Lagenaria siceraria*, seeds taken from net float (fig. 1B). Note small size and absence of paired protuberances. D. *L. siceraria*, broad, flat type of seeds characteristic of the Old World collections of this species. Millimeter scale at bottom.

18 seeds

These are the seeds of the fig-leaf gourd, *Cucurbita ficifolia* (fig. 3A)

1 large batch of seeds

These are mostly seeds of an unidentified species of *Cucurbita*, probably *C. moschata*, Duchesne, since some of them have a fringed margin (fig. 3B). There is a single seed that appears to be of *C. ficifolia*. There are also a few of *Lagenaria siceraria*

HP-3-G

1 bottle gourd net float and seeds removed from it

Lagenaria siceraria, relatively long-necked type; over-all length, 242 mm.; length of neck, 135 mm.; maximum diameter of bulbous portion, 120 mm. Peduncle end corked with tightly fitted plug apparently of same material. Seeds typical of *L. siceraria* found in archaeological collections from South America: average length, 13 mm.; average width, 6 mm. (see fig. 3C)

GOURDS AND SQUASH ASSOCIATED WITH CORNCOBS AND CUPISNIQUE POTTERY,
HUACA PRIETA, TEST 5

HP-5-A1

1 fragmented gourd bowl

Shell 6 mm. thick

6 gourd fragments

Shells ranging from 5 mm. to 10 mm. in thickness

2 stems

1 peduncle 20 mm. in length; the other with a portion of the shell adhering to the peduncle, about 12 mm. long. All the above items are undoubtedly *Lagenaria siceraria*

HP-5-B

2 bottle gourd necks

Neck portion of *Lagenaria siceraria* fruits; one 30 mm. long with shell 3 mm. thick; the other 37 mm. long with shell 5 mm. thick

1 bottle gourd container

Lagenaria siceraria, fragmented, evidently a rather small or immature fruit, the remaining portion appears to be about one-half of the original container; shell wall, 5 mm. thick

1 bottle gourd bowl rim fragment

Lagenaria siceraria, apparently from rim of container used as a bowl; area, 2200 sq. mm., shell wall, 5 mm. thick

6 warty squash fragments

Shell fragments of some warty *Cucurbita*, almost certainly *C. moschata*

7 stems

Peduncles of *Lagenaria siceraria* and unidentified species of *Cucurbita*

HP-5-B8

19 stems

Peduncle fragments; all but 1 are classified as *Cucurbita ficifolia*. The single exception is a peduncle with a portion of the shell attached. Since the attached shell is warty, it is probably some species of *Cucurbita*, most likely *C. moschata*

7 warty squash fragments and 2 shells with stem scars

9 shell fragments of *Cucurbita* sp.; 6 are warty, 3 are smooth; one of the latter may be *Lagenaria siceraria*. The warty shells are probably those of *C. moschata* and are from 1.5 mm. to 3.5 mm. in thickness. The smooth shells vary from 1.5 mm. to 3 mm. in wall thickness

HP-5-B8

Large collection of seeds of *Cucurbita* sp.

Most of them badly eroded, and damaged, perhaps by animals. One seed is definitely *C. moschata*; the remainder are probably *C. ficifolia*

HP-5-House 5, Huaquero pit at entrance

1 bottle gourd

Much the same type as that used for net float (see fig. 1A); over-all length, 245 mm.; neck length, 145 mm.; maximum diameter of bulbous portion, 115 mm.; wall, 4 mm. thick

1 gourd bowl

Broken, fragmented, large; maximum diameter, 173 mm.; wall, 6 mm. thick: *Lagenaria siceraria*

SQUASH SEED AND GOURD SEED ASSOCIATED WITH POTTERY OF CUPISNIQUE AND PRE-CUPISNIQUE TYPE

HP-5, between Floors 1 and 2 of House 7

Cucurbita ficifolia

HP-5-A, general

2 seeds of *Lagenaria siceraria*; 1 small immature seed of *Cucurbita moschata*

HP-5, House 2

1 of *Lagenaria siceraria*; 1 *Cucurbita ficifolia*; 1 *C. moschata*

HP-5, House 5

In poor condition, many appear to be immature; 7 can be positively identified as *Cucurbita moschata*; the remainder are *C. ficifolia*

HP-5-A2

7 seeds of *Cucurbita ficifolia*; 3 of *C. moschata*; 3 of *Lagenaria siceraria*

HP-5-A3

2 seeds of *Lagenaria siceraria*; 5 of *Cucurbita moschata*; the remainder are *C. ficifolia*

HP-5-A4

1 seed of *Cucurbita ficifolia* and several immature seeds of unidentifiable species of *Cucurbita*, possibly *C. moschata*; the remainder are *Lagenaria siceraria*

HP-5-B1

2 seeds of *Cucurbita ficifolia*

HP-5-B6

1 seed of *Lagenaria siceraria*, and 1 seed of unidentified *Cucurbita* badly deteriorated but probably *C. ficifolia*

HP-5-B10

Mostly in poor condition; 6 seeds of *Cucurbita moschata*; the remainder *C. ficifolia*

HP-5-B11

1 seed of *Lagenaria siceraria* and 1 of *Cucurbita ficifolia*

HP-5-C4

2 seeds of *Lagenaria siceraria*; the remainder are in poor condition but are evidently some species of *Cucurbita*; at least 4 are *C. ficifolia* and 3 are *C. moschata*

HP-5-D1

1 seed of *Cucurbita ficifolia*

HP-5-D2

1 seed of *Lagenaria siceraria*; 3 seeds of *Cucurbita ficifolia*; remainder small seeds with fringed margin, *C. moschata*

DISCUSSION AND CONCLUSIONS

The material from the pre-ceramic, pre-maize horizon at Huaca Prieta indicates that *Lagenaria siceraria* and two species of *Cucurbita* (*C. ficifolia* and *C. moschata*) were being cultivated during this period. The abundant materials of *L. siceraria* suggest that it was widely used for a number of purposes by the inhabi-

tants of this site (see p. 3). The large, broad seeds (see fig. 3D) show a striking resemblance to the Old World collections of this species. This point may or may not have some significance. However, it does seem important to note that they are markedly unlike the small narrow seeds, mostly without paired protuberances, characteristic of other South American archaeological collections of this species (compare figs. 3C and 3D). This new information suggests that if *L. siceraria* is a native of the Old World, it was introduced into South America at a very early date. On the other hand, there is no clear evidence that negates the idea that this species was a New World endemic and was domesticated in the Americas.

There is good evidence from the peduncles, shell fragments, and seeds that *Cucurbita ficifolia* was cultivated contemporaneously with *Lagenaria*. In addition, there is some indication from the seeds (one large batch of seeds) that another species of *Cucurbita* was present. The fringed margins of these specimens permits one with some confidence to assign them to *C. moschata* (Whitaker and Bohn, in press). In this group are found the modern varieties Sugar Marvel, Butternut, etc. However, at this horizon no substantiating evidence from peduncles or shells has been discovered.

Thus from the pre-ceramic, pre-maize horizon there is evidence for the presence of three species of the family Cucurbitaceae; first, abundant material of shells, peduncles, and peculiar broad seeds of *Lagenaria siceraria*; second, peduncles, seeds, and possibly shells of *Cucurbita ficifolia*; third, seeds of *C. moschata*. The estimated date for the beginning of this horizon is about 3000 B.C. (Bird, 1948).

Coming to the corncob, Cupisnique pottery horizon, *Lagenaria siceraria* is still present in abundance, but there are no specimens of the broad-seeded form found in the earlier horizon. *Cucurbita ficifolia* continued to be cultivated, although the seeds of this species are somewhat different from those associated with the pre-ceramic, pre-maize horizon in that they seem to be specimens from the dingy white-seeded form of this species rather than the black-seeded form characteristic of the older horizon.

A new element, the warty squash, enters the picture at this point, occurring stratigraphically slightly earlier than maize. It is probably a form of *Cucurbita moschata*. Warty varieties are found in *C. moschata*, *C. pepo*, and *C. maxima*, but warty forms of

C. ficifolia are unknown. *Cucurbita pepo* is strictly North American in origin and distribution. Thus *C. moschata* and *C. maxima* remain as possibilities. There is considerable evidence that *C. moschata* is endemic in the northern portion of South America, i.e., Peru and Colombia, while *C. maxima* is native to southern Brazil and northern Argentina. Additional evidence is supplied by the seeds which are typical of those with a fringed margin characterizing some varieties of *C. moschata* (Whitaker and Bohn, in press). Furthermore, none of the seeds in the entire collection resembled *C. maxima*.

It is probable that the variety of *C. moschata* cultivated at this time had a warty exterior and seeds with a pronounced, fringed margin. However, it must be remembered that warty shells were not associated with fringed-margined seeds in the earlier horizon.

Varieties of *Cucurbita moschata* with fringed-margined seeds must have had a widespread distribution in Peru during pre-contact times. Carter (1945) reports seeds of this type in the Uhle collections from Chincha, Peru. The chronology is given as late pre-Columbian (ca. 1300–1500 A.D.).

If *Cucurbita ficifolia* was cultivated by the peoples of this period, and the evidence is very good in this respect, its presence deserves special comment. *Cucurbita ficifolia* has never been reported from archaeological collections in either North or South America. It has generally been considered to be endemic in Mexico and Central America. Its presence in Peru at this early date is a puzzle, unless we assume that it is widely adapted. If so, it could have been carried northward by a succession of early migrations.

To summarize, the most important facts brought out by examination of the cucurbitaceous materials from Huaca Prieta are: 1, there is abundant material of *Lagenaria siceraria* present in both horizons; 2, in the pre-ceramic, pre-maize horizon there are seeds of the broad-seeded form of *L. siceraria*, typical of collections of this species from the Old World; 3, a black-seeded form of *Cucurbita ficifolia* is present in the early horizon, and a dingy white-seeded form in the later horizon; 4, in the pre-ceramic, pre-maize horizon, there are fringed-margined seeds of *C. moschata*; 5, in the later horizon (corn-cob, Cupisnique pottery) there are warty shells of some variety of *C. moschata*; associated with these warty shells are fringed-margined seeds of the same species.

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